

## THE CLASSIFICATION OF THE PUPAE OF THE CERATOCAMPIDÆ AND HEMILEUCIDÆ.

EDNA MOSHER.

The pupae belonging to the superfamily Saturnioidea may be identified by the following characteristics: Fifth and sixth abdominal segments free in both sexes; body surface hard and firm, always with setae, but these rarely long enough to be observed with the unaided eye; face-parts never with distinct sutures; antennal suture obsolete; labial palpi or maxillary palpi never visible; distinct cases for the mandibles never present, these structures often represented by an elevation or a distinct tubercule adjoining the caudo-lateral angles of the labrum; antennae usually showing distinct pectinations, the width at least one-fifth the length and usually much wider, the stem of the flagellum distinctly raised above the level of the pectinations, or if the stem of the flagellum is not distinct, then the body with the cephalic margins of the movable segments produced into distinct flange-like plates; maxillae, measured on the meson, seldom more than one-sixth the length of the wings, if longer, then the body surface without visible setae; third pair of legs very seldom visible; pupae usually more than an inch in length.

The pupae of this superfamily are found either in thick silken cocoons or thin "papery" ones, or in the ground. More than twenty genera are found in North America; of these, the pupae of only sixteen genera were available for study.

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The superfamily Saturnioidea may be divided into three families as follows:

- A. Pupae with the movable segments provided with flange-like plates which prevents their being telescoped, their lateral margins distinctly tapering caudad and each segment noticeably smaller than the segment cephalad of it; wings never elevated dorsad above the surface of the body; a distinct cremaster always present; stem of the flagellum of the antenna never elevated and distinct.
- B. Pupae with a distinctly bifurcate cremaster; body usually roughened with spines on the exposed surface of the thorax and abdomen; metathorax with prominent oblong tubercles on each side the meson extending one-third or more of the distance between the meson and the margin of the first pair of wings; pupae always found in the ground.....**Ceratocampidæ**
- BB. Pupae without a distinctly bifurcate cremaster; body never roughened with spines on the exposed surface of thorax and abdomen; metathorax never with prominent oblong tubercles; pupae found either in cocoons or in the ground...**Hemileucidæ**
- AA. Pupae with the movable segments never provided with flange-like plates which prevent their being telescoped, the lateral margins approximately parallel so that the segments appear of equal size and are usually telescoped so that only the caudal margins of the segments are visible; wings prominently elevated dorsad above the level of the body, the caudal portion of the mesonotum and metanotum always depressed adjacent to the wings; a distinct cremaster rarely present; stem of the flagellum of the antenna always elevated and distinct.  
**Saturniidæ**

#### THE FAMILY CERATOCAMPIDÆ.

Body with the margins of the free abdominal segments usually bearing a row of spines, and the exposed surface of the thorax and abdomen usually roughened with spines; antennae never broadly pectinate throughout, but broadly pectinate and almost parallel for about one-half the length, then narrowed rapidly to about half the greatest width, tapering gradually to a pointed tip, the stem of the flagellum never distinct, the surface convex and the central axis of the antenna usually bearing one or two rows of small spines; maxillae, measured on the meson, never less than one-fourth the length of the wings; tips of the tarsi of the second pair of legs meeting obliquely on the meson, never lying adjacent on the meson; proleg scars very prominent on abdominal segments five and six, the scars for the anal prolegs often very conspicuous; first pair of wings with the anal angles broadly rounded, usually located at the cephalic margin of the fourth abdominal segment and never reaching ventrad to the caudal margin of the fourth segment; second pair of wings never produced below anal angle of first wing and

never visible in ventral view; metathorax with distinct tubercles more or less oblong in outline on each side the meson and extending more than one-third the distance from the meson to the margin of the wing; the suture between the seventh and eighth segments never deep with distinct crenulations on its margins; cremaster always present, usually long and bifurcate at tip. Five genera of this family have been described. One genus, *Syssphinx*, consisting of three species, was not available for study. The remaining genera of *Ceratocampidæ* can be separated by the following table:

- A. Surface of pupa never spinose; cremaster broader than long, broadly and shallowly bifurcate, never over 2 mm. in length.....**Citheronia**
- AA. Surface of pupa spinose; cremaster at least twice as long as broad, bifurcate at tip, always more than 2 mm. in length.
  - B. Thorax rugose with short isolated spines, abdominal segments not spinose, but bearing a row of spines along both cephalic and caudal margins of segments 1 to 7, the spines along the caudal margins of segments 5 to 7 much longer than the spines of the cephalic rows.....**Basilona**
  - BB. Thorax and abdominal segments densely spinose; abdominal segments 1 to 7 with a row of spines along both cephalic and caudal margins, the spines in the cephalic rows on abdominal segments 5 to 7 usually much longer than the spines in the caudal rows; maxillæ, measured on meson, one-fourth the length of the wings.
    - C. Usually with prominent scattered spines on the thoracic segments, at least four times as long as those covering the segments; antennæ with the central axis bearing a row of prominent spines curved caudad; if without prominent spines on the thoracic segments and antennæ, then the maxillæ, measured on meson, one-third the length of the wings.
      - D. Eighth abdominal segment never with a prominent transverse ridge in the middle of the segment bearing a row of spines; glazed eye-piece always lighter in color than the remaining surface of the body; species always more than an inch in length.  
**Adelocephala**
      - DD. Eighth abdominal segment always with a prominent transverse ridge in the middle of the segment bearing a row of spines; glazed eye-piece always the same color as the remaining surface of the body; species never more than an inch in length. **Dryocampa**
    - CC. Without prominent scattered spines on the thoracic segments, the longest never four times the length of those covering the segments; antennæ with the central axis never bearing prominent spines, the spines never curving caudad; maxillæ, measured on meson, always one-fourth the length of the wings.....**Anisota**

*Genus Citheronia* Hübner.

Face-parts and appendages not at all elevated; body surface not roughened with spines; eye-pieces both present; invaginations for the anterior arms of the tentorium small but distinct; clypeo-labral suture present; labrum a little wider than long; maxillae, measured on the meson, about two-fifths the length of the wings, but little longer than the greatest width, triangular in outline; tips of the tarsi of the first and second pair of legs meet obliquely on the meson; median line distinct on all thoracic segments; mesothorax with a few minute tubercles at the bases of the wings; metathorax with a prominent oblong tubercle or plate, irregularly sculptured at the sides, on each side the meson, extending more than half the width of the segment and nearly its whole length; cephalic margins of abdominal segments 5 to 7 produced into thin, plate-like ridges; spiracular line curved slightly ventrad; cremaster short and bifurcate at tip.

This genus is found principally east of the Mississippi and consists of two species, *C. regalis* and *C. sepulchralis*. Specimens of the latter were not available for study. The pupae of *C. regalis* have a peculiar odor somewhat resembling laudanum.

***Citheronia regalis*** Fabricius. Color dark brown, almost black; body surface usually polished, occasionally roughened with indeterminate transverse striations; antennae in both sexes with the length more than four times the greatest width and reaching about half way along the exposed portion of the second pair of legs; face parts with a slightly raised line on each lateral margin of the clypeus extending cephalad from the proximo-lateral margins of the labrum to the proximal ends of the antennae; labrum variable, five-sided, pointed at the distal end; maxillae much longer than broad, the proximal margin sinuate; prothoracic spiracle with elevated margins, the cephalic margin forming a prominent rounded ridge; mesothorax with a small tubercle on each side the meson on the caudal half of the segment, a tubercle scar laterad of each tubercle and in line with it, and a smaller tubercle near the caudal margin of the alar area on each side; abdominal segments 2 to 7 with a row of punctures near the cephalic margin, in



the movable segments, at the caudal margin of the ridge and extending all around the segment; segmentation in abdominal segments 8 to 10 hard to determine; the eighth segment usually polished, its dorsal cephalic margin roughened and plate-like, with a row of punctures along the cephalic margin of the plate and opening cephalad; abdominal segments with two dorsal rows of tubercle scars and one ventral row; cremaster short, never exceeding two millimeters in length, broader than long and broadly and shallowly bifurcate at tip. Length  $1\frac{3}{4}$ "- $2\frac{1}{2}$ "; girth about equal to length.

*Genus Basilona* Boisduval.

Face parts slightly elevated above the level of the appendages; body surface roughened with spines; eye-pieces both present; invaginations for the anterior arms of the tentorium small and indistinct; clypeo-labral suture present; labrum with the length and breadth approximately equal; maxillae, measured on the meson, with the length twice the greatest width and one-half the length of the wings, triangular in outline; tips of the tarsi of the first pair of legs usually meeting on the meson, but sometimes falling short so that the tips of the maxillae lie between them; tips of the second pair of legs always meeting obliquely on the meson; median line distinct on prothorax and mesothorax and sometimes showing on the cephalic half of the metathorax; metathorax with a prominent oblong roughened tubercle with fluted edges on each side the meson, extending half the distance between the meson and the margin of the first pair of wings; cephalic margins of abdominal segments 5 to 7 never with any indications of a plate or ridge; spiracular line curved slightly ventrad; cremaster long, bifurcate at tip.

This genus contains a single species, *Basilona imperialis*, found in the states east of the Mississippi.

***Basilona imperialis*** Drury. Color dark brown; body surface with indeterminate sculpturing and roughened with spines; antennae with the length four times the greatest width, the central axis set with a row of short spines directed caudad; face parts roughened with spines irregularly arranged, with the exception of a row extending cephalad from each proximo-lateral angle of the labrum to the proximal end of the antenna,

sometimes confused with the general sculpturing; labrum variable, usually five-sided, pointed at the distal end; maxillae with the length twice the breadth, each half quadrilateral; prothorax slightly wrinkled, with a row of spines around entire margin except in the region of the spiracles; mesothorax with fine indeterminate transverse striations and very small spines, a spinose area extending from the meson to the alar area, a few small spines at the base of the wings; wings with the venation outlined with short spines; abdominal segments 1 to 8 with an interrupted row of very small spines along the cephalic margin dorsally, and with many large semicircular to ovate punctures caudad of the spines, distributed over the cephalic third of the segment and the spiracular region, the remainder of the segment sparsely covered with smaller circular punctures; caudal margins of all abdominal segments with a row of small curved spines directed caudad, the spines larger than those on the cephalic rows, the largest on segments 8 to 10; lateral cephalic margins of abdominal segments 5 to 7 cephalad of the spiracles with three prominent transverse ridges with distinct furrows between; cremaster from 5 to 7 millimeters in length, a smooth dorsal concavity at the cephalic end, then strongly rugose to the bifurcate tip. Length  $1\frac{3}{4}$ " to 2"; girth about equal to length.

*Genus Adelocephala* Herrich-Schaeffer.

Face parts very slightly raised above the level of the appendages; body surface roughened with spines; eye-pieces both present, the glazed eye-piece always lighter in color than the remaining body surface; invaginations for the anterior arms of the tentorium small, but distinct; clypeo-labral suture present; labrum broader than long; maxillae, measured on the meson, never less than one-fourth the length of the wings, triangular in outline; distal two-thirds of the tarsi of the first pair of legs adjacent on the meson, the tips of the tarsi of the second pair of legs meeting obliquely on the meson; median thoracic line distinct on prothorax and mesothorax; metathorax with an oblong tubercule on each side the meson, not prominently elevated, but slightly rugose and polished; cremaster long, bifurcate at tip.

This genus contains two species, *bicolor*, found in the Mississippi Valley and the Southern Atlantic states, and *bisecta*, found in the Ohio Valley. The species may be separated as follows:

- A. Antennae with prominent spines; spines of cephalic margins of abdominal segments 5 to 7 larger than those on the other segments.....*bicolor*  
 AA. Antennae without prominent spines; spines on the cephalic margins of abdominal segments 5 to 7 not larger than those on the other segments.....*bisecta*

**Adelocephala bicolor** Harris. Color dark reddish brown; head, thorax and appendages finely spinose; abdominal segments both punctate and finely spinose; antennae with the length four times the greatest width, strongly convex, with two rows of spines, the outer row, large, prominent and curved caudad, the mesal row minute; face parts with an elevated spiny ridge on each side extending cephalad from the proximo-lateral angles of the labrum to the proximal end of each antenna, bearing a prominent spine near the cephalic end and a smaller one half way between this and the labrum; epicranial area with two prominent spines on each side the meson at the proximal end of each antenna; sculptured eye-piece with a prominent spiny tubercle; labrum usually six-sided, broader than long, maxillae with length and greatest width equal, each half quadrilateral, the length measured on meson, one-fourth the length of the wings; first and second pair of legs elevated and convex; cephalic portion of prothorax prominently elevated on meson sloping gradually to lateral margins, the larger spines on the elevation pointing dorsad, a slight elevation with larger spines near the meson at caudal margin on each side the meson; prothoracic spiracles with cephalic margins arcuate; mesothorax with a slightly elevated ridge each side the meson with at least two bifid spines, a prominent spine at the base of each wing and another half-way between these spines and the meson; abdominal segments 1 to 4 with rows of minute spines along the cephalic and caudal margins of the exposed portion; abdominal segments 5 to 7 having the cephalic margins dorsad between the spiracles with sharp transverse ridges and distinct furrows between, ventrad with large circular punctures, the margins produced into flange-like ridges set with broad, flat, erect spines, many of them bifid; the caudal margins of abdominal segments 5 to 7 with similar but very much smaller spines, the spines of both cephalic and caudal rows much smaller

on the venter; abdominal segments 8 to 10 thickly punctate, the eighth segment with a distinct lateral protuberance on each side and a prominent tubercule on the meson; ninth and tenth segments with some larger spines on the lateral margins; cremaster with a smooth V-shaped area on the proximal end at dorsum, with the point of the V prolonged down the middle of the cremaster, the remainder of the surface irregularly rugose and bifurcate at tip for about one-fourth the length, the tips divergent. Length  $1\frac{1}{2}$ " to  $1\frac{3}{4}$ ", cremaster one-seventh of total length; girth slightly less than length.

**Adelocephala bisecta** Lintner. Color dark reddish brown; head, thorax and appendages very finely spinose; antennae with the length about three times the greatest width, sometimes exceeding this, slightly convex and without prominent spines; face parts without prominent ridges or spines; labrum somewhat six-sided, tuberculate; maxillae with the length greater than the breadth, the length measured on meson, one-third the length of the wings; thorax without any prominent spines; abdominal segments 1 to 8 with rows of minute spines along the cephalic and caudal margins of the segments; segments 9 and 10 with rows of spines near the caudal margins, and without any prominent lateral spines; cremaster very rugose, bifurcate at tip for less than one-fourth its length, the tips but slightly divergent. Length  $1\frac{1}{2}$ " to  $1\frac{3}{4}$ ", the cremaster about one-ninth the total length; girth about equal to length.

*Genus Dryocampa* Harris.

Face parts elevated above the level of the appendages; body roughened with spines; antennae with a row of prominent spines curving caudad on each central axis; eye-pieces both present; invaginations for the anterior arms of the tentorium small, but distinct; clypeo-labral suture present; labrum a little wider than long; maxillae, measured on meson, one-fourth the length of the wings, triangular in outline; about half the exposed portion of the first pair of legs lying adjacent on the meson; tips of the tarsi of the second pair of legs meeting obliquely on the meson; median line elevated on prothorax and distinct on mesothorax, represented on the cephalic two-thirds of the metathorax by a clear elevated area; metathorax with a prominently elevated, polished tubercule on each side the median elevation, slightly rugose and extending at least one-third the distance from the meson to the margin of the

first pair of wings; cephalic margins of abdominal segments 5 to 7 produced into prominent flange-like ridges directed cephalad and set with spines; abdominal segments 9 and 10 with prominent lateral spines; cremaster long, over one-seventh the total length of the body, bifurcate at tip.

This genus includes a single species, *Dryocampa rubicunda*, found east of the Mississippi.

**Dryocampa rubicunda** Fabricius. Color dark brown to black; exposed surface of head, thorax and appendages finely spinose, the abdominal segments both punctate and spinose; face parts with an elevated spiny ridge on each side extending cephalad from the proximo-lateral angles of the labrum to the proximal end of each antenna, bearing two or three prominent spines; epicranial area with a prominent laciniate spine on each side the meson at the proximal end of each antenna directed cephalo-laterad and giving the pupa a horned appearance; glazed eye-piece usually one-third or more the entire width, the sculptured portion bearing at least one prominent spine; labrum six-sided, usually slightly sunken, pointed at distal end; maxillae with the greatest width and length approximately equal, each half triangular; prothorax with a few slightly larger spines on each side the median line; prothoracic spiracles with the cephalic margins arcuate; mesothorax with two prominent spines along cephalic margin near the meson, a large scattered group at base of wing and half way between these two groups on each side the largest thoracic spine; abdominal segments 1 to 4 with a row of minute spines along both cephalic and caudal margins; abdominal segments 5 to 7 with the margins punctate, produced into flange-like ridges directed cephalad and bearing a row of large sharp spines occasionally bifid or trifold and about one-third the length of the segment, the caudal part of these segments with a distinct furrow near the caudal margin separating the cephalic spinose portion from a narrow smooth portion, with a row of small spines between it and the transverse conjunctiva; eighth abdominal segment with a row of large spines dorsally on the summit of a median transverse ridge, extending laterad and becoming indistinct on the ventral aspect; abdominal segments 9 to 10 with prominent lateral spines curving caudad; cremaster irregularly, longitudinally rugose, bifurcate at tip with the points widely divergent. Length 7-8" to 1"; girth less than length.



Genus *Anisota* Hübner.

Body with the cephalic margins of abdominal segments 5 to 7 produced into flange-like ridges directed cephalad, and set with spines; exposed surface of head and thorax spinose, the abdominal segments both spinose and punctate; both eye-pieces present, the sculptured portion spinose; invaginations for the anterior arms of the tentorium small, but distinct; clypeo-labral suture present; labrum variable, small, never twice as broad as long; maxillae, measured on the meson, always one-fourth the length of the wings, triangular in outline; tarsi of the first pair of legs adjacent on the meson, tips of the tarsi of the second pair meeting obliquely on the meson; metathorax with a prominent oblong tubercule on each side the meson, extending more than one-third the distance between the meson and the margin of the first pair of wings; cremaster always long and bifurcate at tip.

This genus includes at least five species commonly found in the United States, one of these, *A. skinneri*, is reported from Arizona, the other four from the states east of the Mississippi.

These five species can be separated by means of the following table:

- A. Cremaster one-eighth or more of the total length of the body; spines on the epicranial area at the proximal end of each antenna large and prominent, extending beyond the margin of the body in ventral view and giving the pupa a horned appearance.
  - B. Cremaster more than one-eighth the total length of body and bifurcate for less than one-fourth its length; small species, less than one inch in length..... **virginiensis.**
  - BB. Cremaster about one-eighth the total length of the body and bifurcate for one-fourth its length; species one inch or more in length.
    - C. Face parts prominently elevated above the level of the appendages; mesothorax with at least one lacinate spine on each side the meson near the cephalic margin.
      - CC. Face parts not elevated above the level of the appendages; never with a lacinate spine on each side the meson near the cephalic margin..... **senatoria stigma**
- AA. Cremaster less than one-eighth the total length of the pupa; spines of the epicranial area at the proximal end of each antenna never extending beyond the margin of the body in ventral view, so that the pupa does not present a horned appearance.
  - B. Each metathoracic tubercule very prominently elevated, its length more than half the length of the segment and extending at least half the distance from the meson to the margin of the first pair of wings; color black..... **skinneri**
  - BB. Each metathoracic tubercule somewhat diamond shaped, never very prominently elevated, its length never as much as half the length of the segment, and never extending half the distance between the meson and the margin of the first pair of wings; color bright reddish brown..... **consularis**

**Anisota virginensis** Drury. Color dark brown to black; abdominal segments 1 to 4 and 8 to 10 with few spines and more large circular punctures as compared with the remainder of the surface; each antenna with two rows of minute spines on the central axis, the length three times the greatest width; face parts prominently elevated above the level of the appendages, an elevated densely spinose ridge extending cephalad from the proximo-lateral angles of the labrum to the proximal end of each antenna with a large spine at its cephalic end; epicranial area with one large spine and several smaller ones on each side the meson near the proximal end of each antenna; labrum variable, usually six-sided, with two small tubercles or spines, the width greater than the length, pointed at distal end; maxillæ with the length and breadth approximately equal, each half quadrilateral; median thoracic line distinct on all segments; prothorax with the median line slightly elevated; mesothorax without prominent spines, usually with two tubercle scars on each side the meson, sometimes spine-like, seldom all prominent; metathoracic tubercles wedge-shaped, irregularly impressed, black and polished, each extending less than half the distance from the meson to the margin of the first pair of wings; abdominal segments 1 to 3 with an indistinct row of minute spines along both cephalic and caudal margins of the segment; abdominal segments 5 to 7 with the cephalic margins punctate and produced into flange-like ridges projecting cephalad and set with stout spines less than one-sixth the length of the segment; caudal margins of segments 4 to 7 with a slight depression, the elevation adjacent to the transverse conjunctiva set with two rows of minute spines; eighth segment with a transverse ridge in the middle of the segment set with spines, with slightly larger spines on the lateral margins of the segment; ninth abdominal segment with prominent lateral spines and the tenth with a prominent hooked spine on each side the base of the cremaster; cremaster longitudinally rugose, bifurcate for less than one-fourth its length, the tips divergent. Length 7-8"; cremaster about one-seventh the total length; girth less than length.

**Anisota stigma** Fabricius. Color dark reddish brown; antennæ in both sexes with the length about three times the greatest width, central axis bearing a row of minute spines;

face parts prominently elevated above the level of the appendages, an elevated ridge extending cephalad from each proximo-lateral angle of the labrum to the proximal end of each antenna, bearing a large laciniate spine near its cephalic end; epicranial area with a stout curved spine on each side the meson near the proximal end of the antenna; labrum variable, usually hexagonal, with two small tubercles or spines and pointed at the distal end; prothorax with the median line generally elevated, more densely spinose on each side adjacent to the meson than on the remainder of the segment; mesothorax with one and sometimes two laciniate spines on each side the meson near the cephalic margin with sometimes one or two smaller spines, a scattering group of spines at the base of each wing and one spine on each side, half-way between the base of the wing and the meson, which is larger than those covering the segment; metathoracic tubercles rugose, somewhat diamond-shaped, each extending about half the distance from the meson to the margin of the first pair of wings, subadjacent on the meson; abdominal segments 1 to 3 with a row of minute spines along both cephalic and caudal margins of the segment; cephalic margins of abdominal segments 5 to 7 punctate and produced into flange-like ridges directed cephalad, bearing a row of prominent, erect, triangular spines, less than one-fourth the length of the segment; caudal margins of abdominal segments 4 to 7 with a furrow near the caudal margin of the segment and a row of spines on the elevation at the junction of the segment and the transverse conjunctiva, these spines about one-third the size of the spines in the cephalic rows; abdominal segments 8 to 10 with fewer spines and more punctures on the surface; the eighth abdominal segment with a prominent transverse ridge in the middle of the segment, with a slight protuberance on each lateral margin, the transverse ridge set with spines similar to those along the caudal margins of segments 4 to 7, a smaller row along the caudal margin of the segment; ninth abdominal segment with two rows of spines near the caudal margin with two or three prominent ones along each lateral margin; tenth segment with two or three prominent spines along each lateral margin at the proximal end of cremaster; cremaster with a smoother, triangular depressed area dorsad at proximal end, the remainder of the surface rugose with wavy longitudinal ridges, the caudal end bifurcate for

less than one-fourth of the length, the tips divergent. Length 1"—1 1-8"; cremaster about one-ninth the total length; girth equal to length.

**Anisota senatoria** Smith and Abbott. Color dark brown to black; antennae scarcely convex, each central axis with two rows of minute spines, length about three times the greatest width; face parts slightly elevated above the level of the appendages; no prominent ridge extending cephalad from each proximo-lateral angle of the labrum, but a prominent curved spine on each side the cephalic part of clypeal area adjacent to the proximal end of each antenna; epicranial area with a prominent curved spine at the proximal end of each antenna and usually one or two smaller ones; labrum usually six-sided, broader than long, usually with two small tubercles, slightly pointed at the distal end; maxillae with the length slightly greater than the greatest width, each half quadrilateral; prothorax with a dense row of slightly larger spines on each side the median line; mesothorax with a tubercle scar on each side the meson indicated by a small polished area; mesothorax without prominent spines; metathorax with the tubercles oblong, slightly rugose, black and polished, each extending less than half the distance from the meson to the margin of the first pair of wings; abdominal segments 1 to 3 with a row of minute spines along the cephalic and caudal margins of each segment; cephalic margins of abdominal segments 5 to 7 with one distinct furrow dorsally and punctate around entire segment, produced into flange-like ridges bearing stout spines about one-fourth the length of the segment; abdominal segments 4 to 7 with a distinct depression near the caudal margin of the segment and with a caudal row of small spines between the segment and the transverse conjunctiva, with an interrupted row of smaller spines just cephalad; eighth abdominal segment with a distinct median transverse ridge bearing spines similar to those on the cephalic margins of segments 5 to 7, a row of small spines along the cephalic margin of the ninth abdominal segment with two rows of spines near its caudal margin and several prominent lateral spines; tenth abdominal segment with one or two prominent lateral spines at the proximal end of the cremaster, smaller than those on the ninth segment; cremaster with a slightly depressed



heart-shaped area at the proximal end with fine longitudinal ridges, about three-fifths of the remaining length finely rugose, the distal end smooth, bifurcate for about one-fourth its length, the tips slightly divergent. Length 1 1-S"— $1\frac{1}{4}$ "; cremaster about one-ninth the total length; girth less than length.

**Anisota skinneri** Biederman. Color dark brown to black; antennae with the length three times the greatest breadth, a row of minute spines on the central axis of each antenna; face parts slightly raised above the level of the appendages, the ridge extending cephalad from each proximo-lateral angle of the labrum scarcely indicated, a medium sized laciniate spine on the face parts near the proximal end of each antenna; epicranial area with a long laciniate prominence or ridge, which is never horn-like, with a small spinose tubercle caudad of it on each side the meson near the proximal end of each antenna; labrum variable, usually five-sided, broadly rounded or slightly pointed at the distal end; maxillae with the length and breadth approximately equal, each half quadrilateral; prothorax more densely spinose on each side adjacent to the median line; mesothorax without any especially prominent spines; metathoracic tubercle strongly elevated, ovate, irregularly impressed, almost adjacent on the meson, and extending half the distance from the meson to the margin of the first pair of wings; abdominal segments 1 to 4 with a row of minute, closely set spines along both cephalic and caudal margins of the segment; cephalic margins of abdominal segments 5 to 7 dorsad with sharp transverse ridges with distinct furrows between and punctate around entire segment, produced into flange-like ridges set with spines only about one-eighth the length of the segment; abdominal segments 4 to 7 with a distinct furrow near the caudal margin of the segment and two distinct rows of minute spines between the segment and the transverse conjunctiva; eighth abdominal segment with a slightly elevated transverse ridge in the middle of the segment set with small spines and another row at the caudal margin of the segment; ninth abdominal segment with two rows of spines at the caudal margin of the segment, some spines slightly more prominent at each lateral margin; tenth abdominal segment with a small lateral spine on each side the cremaster;



cremaster with a small, triangular, slightly depressed area at the proximal end of cremaster dorsad, but rugose much like the remainder of the surface, bifurcate at tip for less than one-fourth the length, the tips not divergent. Length 1 3-8"—1 5-8"; cremaster about one-tenth total length; girth exceeding length.

**Anisota consularis** Dyar. Color bright reddish brown; antennae with the length about four times the greatest width; face parts slightly raised above the level of the appendages, an elevated ridge extending cephalad from each proximo-lateral angle of the labrum to the proximal end of each antenna and bearing several prominent spines; epicranial area with a large spine on each side the meson near the proximal end of each antenna; labrum variable, usually five-sided, broader than long and bearing two minute tubercles or spines, slightly pointed at the distal end; maxillae with the length greater than the breadth, each half quadrilateral; prothorax with a larger spine on each side the median line near the middle of the segment; mesothorax without any especially prominent spines, a few longer ones at the base of each wing; metathoracic tubercles irregular, somewhat diamond-shaped, black and polished, irregularly impressed or punctate, each tubercle extending less than half the distance from the meson to the margin of the first pair of wings; abdominal segments 1 to 4 with a row of very minute spines on each cephalic and caudal margin; abdominal segments 5 to 7 with the cephalic margins punctate and produced into flange-like ridges directed cephalad and set with spines less than one-sixth the length of the segment, a smooth band at the caudal margin of the segments and a row of small spines along the segment adjacent to the transverse conjunctiva, almost wanting on the seventh segment; eighth segment with a row of spines on a slight transverse ridge in the middle of the segment, becoming indistinct in ventral view, the caudal row of spines indistinct dorsad, but very distinct laterad and ventrad; ninth abdominal segment with a caudal row of spines, a prominence on the lateral margin set with longer spines; the tenth segment with two prominent lateral spines on each side of the cremaster; cremaster with a small, triangular depressed area, much smoother than the remainder of the surface, which is longitudinally rugose, bifurcate for about

one-fourth the length, the tips divergent. Length 1 1-8"—1 3-8"; cremaster less than one-eighth the total length; girth equal to length.

#### THE FAMILY HEMILEUCIDÆ.

Margins of the free segments never with a row of spines; the body surface never roughened with spines; antennae with the stem of the flagellum never distinct, the central axis never set with spines, the antennae tapering gradually from the part with the greatest width; maxillae measured on the meson never more than one-sixth the length of the wings; proleg scars seldom prominent on abdominal segments five and six and rarely with the anal proleg scars visible; first pair of wings with the anal angles broadly rounded, usually at the cephalic margin of fourth abdominal segment, and usually reaching the caudal margin of the fourth abdominal segment ventrally; second pair of wings never produced below the anal angles of the first pair of wings and never visible in ventral view; metathorax never with prominent tubercles; abdominal segments 5 to 7 with their cephalic margins produced into thick oblique flange-like plates directed caudad; cremaster short, never bifurcate at tip.

Altho not usually included with the Hemileucidæ the genus *Automeris* is placed in this group owing to the very evident relation of the pupae to those of the genera *Hemileuca* and *Pseudohazis*. Morphologically they seem to be more nearly related to the Hemileucidæ, but they are found in cocoons like the Saturniidæ.

The description of this family is of necessity very incomplete owing to lack of material. According to our available knowledge of the subject the three genera may be separated as follows:

- A. Cremaster bearing setae arranged in a transverse row and spreading out fan-like.....**Pseudohazis**
- AA. Cremaster never with setae, either with curved spines or without spines or setae of any kind.
  - B. Cephalic part of segment above the flange-like plate either smooth or with fine longitudinal striations; pupae found in ground.  
**Hemileuca**
  - BB. Cephalic part of segment above the flange-like plate with sharp, transverse ridges, deep furrows between; pupae found in cocoons  
**Automeris**

*Genus Hemileuca* Walker.

Face parts slightly elevated above the surface of the body; antennae with the stem of the flagellum indistinguishable from remainder of surface, entire surface flat to uniformly convex, tapering gradually to a point at the distal end; invaginations for the anterior arms of the tentorium distinct; eye-pieces both present; clypeo-labral suture generally distinct; maxillae, measured on meson, never more than one-sixth the length of the wings, each half quadrilateral; less than half the exposed tibiae and the tarsi of the first pair of legs with the tips of the second pair of legs adjacent on the meson; second leg visible for almost entire tibial and tarsal length; median thoracic line always distinct on prothorax and mesothorax, seldom on metathorax; first pair of wings with the anal angles broadly rounded near cephalic margin of fourth abdominal segment; second pair of wings visible along entire dorsal margin of first wing, its margin entire, but never produced beyond anal angle of first pair of wings and never visible on the ventral surface; spiracular line almost straight; cephalic margins of abdominal segments 5 to 7 produced into thick, oblique flange-like plates; suture between the seventh and eighth abdominal segments deep, both margins usually strongly crenulate, the crenulations of the two sides fitting together like a set of teeth; cremaster short, pointed, never exceeding two millimeters in length.

This genus includes at least nine species found in the United States, only three of which are described here. The most common species is *H. maia*, which is found from the Atlantic states westward to the Rocky Mountains. The others are reported from the western states. These moths spend their pupal life in the ground. The species described can be separated by the following key:

- A. Suture between the seventh and eighth abdominal segments very deep, the edges distinctly crenulate.
  - B. Clypeal region strongly convex; labrum strongly elevated; maxillae short, inconspicuous, each half triangular in outline and length on meson less than a millimeter; mesothorax with a tubercle on each side the meson outlined by a depressed ring. burnsi
  - BB. Clypeal region not strongly convex; labrum not elevated; maxillae conspicuous, each half quadrangular in outline and meeting on meson for at least a millimeter; mesothorax without tubercles on each side the meson. maia
- AA. Suture between the seventh and eighth abdominal segments not very deep, the edges without distinct crenulations. olivianæ

**Hemileuca maia** Drury. Color dark brown; face-parts and appendages with fine transverse striations, remainder of surface shagreened, excepting abdominal segments 8 to 10; face-parts without a prominent convexity in clypeal region; antennae in male with length four times the width, the sides parallel for at least the proximal two-thirds of their length and then tapering rapidly to a point, reaching just below the tips of the first pair of legs; clypeo-labral suture sometimes indistinct; labrum about twice as broad as long; quadrate and broadly truncate at distal end; maxillae, measured on meson, one-sixth the length of wings, its median length less than its greatest breadth; first pair of wings with their anal angles at the cephalic margin of fourth abdominal segment; abdominal segments 1 to 4 and 7 to 8 with distinct furrows between, their margins wavy, more apparent on the cephalic margins of the segments; abdominal segments 5 to 7 with their cephalic margins produced into thick flange-like plates covered with fine longitudinal striations and a distinct smooth furrow at the caudal margin of the segment, adjoining the transverse conjunctiva; cremaster nearly two millimeters in length, indefinitely rugose, triangular in outline, pointed at distal end, which bears many hooked spines. Length, abdomen retracted, about 1", girth about  $1\frac{1}{4}$ ".

**Hemileuca maia var. lucina** Hy. Edwards. Specimens of this variety from the New England Entomological Exchange, collected in New Hampshire, show little general difference from *H. maia*. They are much smaller, however, varying from 9-16" to  $\frac{3}{4}$ " in length.

**Hemileuca burnsi** Watson. Color dark brown; face-parts and appendages with fine, transverse striations, the remainder of the body surface shagreened; face-parts with a prominent convexity in the clypeal region; antennae of male with length three times the width, tapering from the region of greatest width to form a long, pointed tip at distal end, ending opposite the tips of the first pair of legs; clypeo-labral suture distinct, labrum elevated, somewhat shield-shaped, rounded at distal end; maxillae very short, scarcely visible, each half of maxilla triangular, much broader than long; prothoracic spiracles with strongly elevated margins; mesothorax with a prominent tubercle on each side the meson, outlined by a depressed ring;

first pair of wings with their anal angles nearly opposite the caudal margin of the fourth abdominal segment; sutures between abdominal segments 1 to 4 distinct, margins of adjoining segments crenulate, suture between segments 7 and 8 very prominent, the dorsal cephalic margin of the suture with longitudinally corrugate ridges, the caudal margin crenulate; abdominal segments 5 to 7 with their cephalic margins produced into a prominent, flange-like plate, with longitudinal striations, never more than indications of a furrow at caudal margins of segments, an elevated roughened line between the caudal margin of the segment and the transverse conjunctiva; cremaster short, not more than a millimeter in length, triangular, rugose, ending in a blunt tip at distal end, without spines. Length about 7-8"; girth about 1".

Described from one male specimen, for which we are indebted to Dr. Wm. Barnes, of Decatur, Illinois.

**Hemileuca oliviæ** Cockerell. Color dark brown; surface of body with interrupted transverse striations or impressions; face-parts slightly elevated, but without a prominent convexity in clypeal region; antennae in male with length a little more than three times the width, the sides parallel for at least two-thirds of the distance and then tapering to form a blunt, rounded tip, ending opposite tips of second pair of legs; clypeo-labral suture distinct; labrum with length and breadth approximately equal, five-sided, with a sharp point at distal end; maxillae, measured on meson, about one-seventh the length of the wings, each half the maxilla quadrilateral, distance between the parallel sides about equal to the length on meson; prothoracic spiracles with slightly raised roughened margins; first pair of wings with their anal angles nearly opposite the caudal margin of the fourth abdominal segment; sutures between abdominal segments 1 to 4 distinct, cephalic margin of sutures approximately smooth, caudal margin of sutures irregularly corrugated and on the fourth segment depressed, suture between segments 7 and 8 not deep, the caudal margin of the seventh segment slightly raised above the eighth segment; abdominal segments 5 to 7 produced into thin flange-like plates, the margins slightly undulate, a distinct furrow at the caudal margin adjoining the transverse conjunctiva, cremaster triangular, the



distal end covered with sharply recurved spines. Length 7-8"—1"; girth about  $1\frac{1}{4}$ ".

Described from one male specimen, for which we are indebted to Dr. Wm. Barnes, of Decatur, Illinois.

*Genus Pseudohazis* Grote and Robinson.

Median thoracic line distinct on the prothorax and mesothorax, faint on the metathorax; first pair of wings with the anal angles broadly rounded, near the cephalic margin of the fourth abdominal segment; second pair of wings visible along entire dorsal margin of first wing, its margin entire, but never produced beyond the anal angle of first pair of wings and never visible in ventral view; spiracular line straight; cephalic margins of abdominal segments 5 to 7 produced into thick, oblique, flange-like plates directed caudad; suture between the seventh and eighth abdominal segments deep, the cephalic margin with distinct crenulations along both margins, the cephalic margin with quadrangular depressions, the caudal margin with deep longitudinal furrows; cremaster short, bearing a fan-shaped group of long straight setae.

This genus and species have been described from a single specimen kindly loaned by the American Museum of Natural History through the kindness of Mr. J. A. Grosbeck. Unfortunately the specimen had lost its prothorax, face-parts, and all appendages except the wings. These descriptions are included, however, to show the relationship of this genus to the genus *Hemileuca*. Little is known of its life history, but it spends its pupal life in the ground. There are three species named in Dyar's "List of North American Lepidoptera," all from the western part of the United States.

***Pseudohazis eglanterina*** Boisduval. Color dark reddish brown; exposed surface of thorax, wings and abdomen coarsely shagreened; abdominal segments 5 to 7 with their flange-like plates shagreened like the remainder of the segment, except for a few faint longitudinal striations near the margin; abdominal segments 4 to 8 with a raised transverse line near the caudal margin of the segment; cremaster about one millimeter in length, indefinitely rugose, conical, bearing a fan-shaped group of coarse, straight setae. Length, abdomen expanded, about 1 1-8"; girth  $1\frac{1}{2}$ ".

*Genus Automeris* Hübner.

Face-parts not noticeably elevated above the body surface; antennae pectinate throughout, tapering gradually to a point at the distal end, the stem of the flagellum never noticeably raised above the level of the pectinations; sexual differences, if any, very slight; invaginations for the anterior arms of the tentorium obscure; eye-pieces both present; clypeo-labral suture usually distinct; maxillae, measured on meson, never more than one-sixth the length of the wings, triangular in outline; less than half the exposed tibiae and the tarsi of the first pair of legs and tips of the second pair adjacent on the meson; second leg visible for almost entire tibial and tarsal length; median thoracic line faint, and seldom found on all segments; first wing with anal angle broadly rounded, near the cephalic margin of fourth abdominal segment; second wing visible around the entire dorsal margin of first wing, its margin entire and produced around anal angle of first wing to form a prominent angle on the fourth abdominal segment, scarcely visible in ventral view; spiracular line slightly curved ventrad; cephalic margins of abdominal segments 5 to 7 with sharp, transverse ridges having distinct furrows between, and produced into an oblique flange-like plate, generally hidden when segments are retracted; abdominal segments 8 to 10 taper gradually to caudal end; cremaster always distinct and set with hooked spines.

This genus includes perhaps more than a dozen species in North America of which four species are described here. These all spin cocoons. Our common species, *A. io*, which is found all over the Eastern United States and Mexico, spins a thin brown "papery" cocoon much like *Tropaea luna*, but thinner and more shapeless. They are found on the ground, usually with a protecting leaf attached and are thin enough so that the pupa may usually be seen through the cocoon. *A. pamina* is described from Arizona and Mexico. Its cocoon is much like that of *A. io*, with many small leaves securely fastened to it. The cocoon of *A. incarnata* of Mexico is very similar to the preceding forms, but thicker and covered with leaves. The cocoon of *A. leucana* is shaped much like that of *Samia cecropia* and covered with small pieces of bark. It is also a Mexican species. These four species can be separated by using the following table:

- A. Cremaster triangular, at least two millimeters long, with a transverse row of hooked spines curving dorsad; cephalic margins of abdominal segments 5 to 7 produced into an oblique, flange-like plate with an undulate margin produced into prominent curves dorsad of the spiracular line..... *leucana*
- AA. Cremaster never triangular, usually only a button-like constriction with a thickly set group of strongly recurved spines, the tips curving outward in all directions; cephalic margins of abdominal segments 5 to 7 produced into an oblique flange-like plate with its margin entire, never produced into curves dorsad of the spiracular line.
- B. Mesothorax with fine indeterminate transverse striations; body setae conspicuous..... *io*
- BB. Mesothorax never with fine indeterminate transverse striations; body setae inconspicuous.
- C. Mesothorax rugose; a small tubercle each side the meson on the metathorax and first three abdominal segments. *pamina*
- CC. Mesothorax tuberculate with blunt conical projections; never with small tubercles each side of the meson on the mesothorax and first three abdominal segments. *incarnata*

***Automeris pamina*** Neumoegen. Color dark brown; body setae inconspicuous, light brown, few in number; face parts and appendages with fine, indeterminate transverse striations; exposed surface of thorax rugose, remainder of surface finely shagreened; length of antennae in both sexes more than four times the breadth and ending in line with the tips of the first pair of legs; labrum variable, length and breadth approximately equal, usually six-sided and pointed at distal end; maxillae, measured on meson, about one-sixth the length of the wings, triangular in outline, median length greater than the greatest width; cephalic margins of abdominal segments 5 to 7 with fine ridges, becoming indistinct on the meson of both dorsal and ventral surfaces, the margin produced into a flange-like plate with its margin entire, never produced into prominent curves; dorsal surface of abdominal segments 4 to 7 with a smooth, elevated line just cephalad of the junction of segment and transverse conjunctiva, extending laterad and ending beyond the spiracles on ventral surface; dorsal and lateral surfaces of tenth abdominal segment rugose with irregular, longitudinal depressions at the base of cremaster. Cremaster short, constricted slightly at base and forming a rounded protuberance with a closely set group of strongly recurved spines, the tips turning outward in all directions. Length, abdomen expanded, from 1 1-8" to 1 1/4"; girth about 1 3/4".

**Automeris io** Fabricius. Color dark brown; body setae conspicuous, light brown, sparsely distributed over entire surface excepting appendages, most numerous on thorax; body often noticeably depressed; face parts, appendages, except the wings, and exposed surface of thorax with fine, indeterminate, transverse striations, remainder of surface shagreened, with the projections in transverse rows; antennae in both sexes with length three times the width and quite reaching the tips of the first pair of legs; labrum variable, broader than long, usually five-sided and pointed at the distal end; maxillae, measured on meson, about one-sixth the length of wings, median length always less than the greatest width, each half the maxilla quadrilateral, sometimes modified so that entire maxilla appears heart-shaped; median thoracic line narrow, usually visible on all segments; abdominal segments 5 to 7 with the cephalic margins covered with sharp transverse ridges, with distinct furrows between, the furrows becoming shallower at the meson on the ventral surface, the flange-like plate with its edges entire; abdominal segments 4 to 7 with a distinct furrow of varying width between the segment and the transverse conjunctiva, which becomes indistinct in the region of the proleg scars on the ventral surface, its cephalic margin being indicated by a raised line; abdominal segments 8 to 10 with segmentation distinct; dorsal surface of tenth abdominal segment with deep, longitudinal ridges at base of cremaster; tip of cremaster with a small group of closely set, sharply recurved spines, the hooks turning outward in all directions. Length, abdomen retracted, 7-8"— $1\frac{1}{4}$ ", expanded, 1"— $1\frac{3}{8}$ "; girth  $1\frac{3}{4}$ "—2".

**Automeris leucana** Hübner. Color dark brown; body setae light brown, inconspicuous; face parts and appendages with indeterminate, transverse striations, exposed surface of thorax rugose, with interrupted transverse ridges; remainder of surface coarsely shagreened; antennae in both sexes with the length more than four times the breadth, not extending as far caudad as the tips of first pair of legs; labrum variable, length and breadth approximately equal, pointed at tip, usually five-sided; maxillae, measured on meson, about one-seventh the length of wings, the greatest width about one and one-half times the median length, each half the maxilla quadrilateral;

median thoracic line very narrow, only distinct on the mesothorax; abdominal segments 5 to 7 with the cephalic margin ridged, produced into an oblique flange-like plate with an undulate margin having prominent curves dorsad of the spiracular line, the median line of cephalic margin indicated by oblique ridges, a slightly raised, smooth line cephalad of the junction of the segment and the transverse conjunctiva; tenth abdominal segment having the dorsal and lateral margins of the cremaster with semi-longitudinal ridges at base of cremaster; cremaster at least two millimeters in length, triangular in outline, tapering rapidly to a pointed tip with a transverse row of sharply recurved spines, the tips curving dorsad. Length, abdomen expanded,  $1\frac{1}{4}$ "—1 5-8"; girth about  $1\frac{3}{4}$ ".

**Automeris incarnata** Walker. Color dark brown to blackish, transverse conjunctiva lighter; body setae light brown, inconspicuous; face parts and appendages with wavy, indeterminate, transverse striations, exposed surface of thorax tuberculate with blunt, conical projections; antennae in both sexes with length about four times the width and ending opposite the tips of the first pair of legs; labrum variable, broader than long, usually five-sided, pointed at distal end; maxillae, measured on meson, about one-sixth the length of the wings, median length less than the greatest width, each half quadrilateral, lateral margins concave, basal half sculptured and roughened; median thoracic line wanting except on metathorax; dorsal and lateral portions of cephalic margins of abdominal segments 5 to 7 with fine, sharp, transverse ridges becoming indistinct in the region of the proleg scars, the cephalic margin narrower in this region and produced all around segment into a very narrow, flange-like plate with a distinct longitudinal impression at meson; abdominal segments 4 to 7 with a raised line cephalad of the line between the segment and the transverse conjunctiva; tenth abdominal segment rugose at base of cremaster; the cremaster short, rounded, constricted at base and set with a small group of closely set, sharply recurved spines, the tips turning outward in all directions. Length, abdomen contracted, about 1", expanded, about 1 1-8"; girth about  $1\frac{1}{2}$ ".